

Powdery mildew resistant pumpkin cultivar evaluation, 2010.

There are many pumpkin cultivars now commercially available that are advertised as having resistance to powdery mildew. Previous experiments have demonstrated that the level of resistance can be highly variable among these cultivars and can in fact be low resulting in limited suppression of powdery mildew. The goal of this experiment was to confirm these results and extend the study to include new cultivars. Growers need to know the degree of expected control from genetic resistance in their management program, and there is concern that this pathogen could be adapting to the major resistance gene in use. A field experiment was conducted at the Long Island Horticultural Research and Extension Center on Haven loam soil. The field was plowed on 10 May and tilled on 14 Jun. A vacuum seeder with the closing wheels removed was used to open a seed furrow and to apply fertilizer in a band about 2 in. away from the seed. A blend of controlled release fertilizers, consisting of 300 lb/A 15-18-12 and 100 lb/A ESN, was used. Seeds were placed in the furrows on 22 Jun by hand with two seed per plant at 36-in. plant spacing within rows. Seed were also planted for a plant of Multipik summer squash, a susceptible cultivar, between plots in each row at 24-in spacing from the adjacent pumpkins to separate plots and to serve as a source of inoculum. Furrows were raked to close. After seedlings were established, doubles were thinned to one plant. Plots contained a total of 12 plants in three rows spaced 68 in apart. A randomized complete block design with four replications was used. Plant vines were moved as needed to maintain plot separation. The herbicides Strategy (3 pt/A) and Sandea (0.5 oz/A) were applied over the entire plot area after seeding on 22 Jun, which was followed by 0.4 inches of rain overnight. During the season, weeds were controlled by cultivating, rototilling, and hand weeding as needed. To supplement rainfall when less than 1 in. per week, water was provided as needed through drip irrigation lines laid next to each planted row. Cucumber beetles were managed by applying the insecticide Admire 2 F (20 fl oz/A) in a narrow band over the planted rows immediately after the herbicide application on 22 Jun and applying Asana XL (9.6 fl oz/A) to foliage on 23 Jul. No fungicides were applied to control powdery mildew. To manage damping-off, Ridomil Gold EC (1 pt/A) was broadcast over the field and incorporated mechanically on 15 Jun. A soil penetrant to increase water penetration, SprayHandler (0.5 pt/A), was applied with Ridomil. The following fungicides were applied to foliage to preventively control downy mildew (*Pseudoperonospora cubensis*) and Phytophthora blight (*Phytophthora capsici*): ProPhyt (3 qt/A) on 23 and 30 Jul; Curzate (3.2 oz/A) on 23 Jul; Ranman 400 SC (2.75 fl oz/A) on 7 Aug, 2 Sep, and 18 Sep; Forum (6 fl oz/A) on 30 Jul and 21 Aug; and Revus (8 fl oz/A) on 28 Aug and 11 Sep. Plots were inspected for powdery mildew symptoms on upper and lower leaf surfaces on 20 Aug, 1 Sep, and 13 Sep. On 20 Aug ten leaves were selected to examine in each plot from the oldest third of the foliage based on leaf physiological appearance and position in the canopy. Eight mid-aged and eight young leaves were examined in each plot for the Sep assessments. Powdery mildew colonies were counted; severity was assessed by visual estimation of percent leaf area infected when colonies could not be counted accurately because they had coalesced and/or were too numerous. Average severity for the entire canopy was calculated from the individual leaf assessments. AUDPC was calculated using the 20 Aug and 1 Sep severity data because some plots had too few or no leaves remaining to assess on 13 Sep. Defoliation was assessed on 2 and 14 Sep. Pumpkin fruit were harvested and weighed on 8 Oct. Most fruit were marketable. Rotten and immature fruit were counted. Fruit quality was assessed. Average monthly high and low temperatures (°F) were 81/64 in Jun, 87/70 in Jul, 83/67 in Aug, 77/62 in Sep, and 66/50 in Oct. Rainfall (in.) was 1.63, 3.46, 2.02, 2.87, and 3.32 for these months, respectively.

No significant differences in powdery mildew severity were detected among cultivars. The susceptible cultivar Sorcerer did have the numerically highest severity value for upper leaf surfaces on 20 Aug and one of the highest values for lower surfaces, but not at the next assessment on 1 Sep. These results contrast with those obtained in previous pumpkin cultivar evaluations conducted at this facility (LIHREC) in which some suppression of powdery mildew has always been detected relative to Sorcerer (PDMR 2:V151, PDMR 3:V131, PDMR 5:V099). Some of the resistant cultivars included in the 2010 experiment demonstrated suppression in previous years. These results suggest that the pathogen has evolved to overcome the major gene for resistance in pumpkin. Four private seed companies developed the cultivars evaluated in 2010. Additionally, powdery mildew resistant melon cultivars evaluated in 2010 at LIHREC also did not provide the level of suppression achieved in previous years. Significant differences were detected among the cultivars in yield. Camaro PMR produced the largest fruit and the greatest weight of marketable (not shown) and total fruit weight per plant. Trophy produced the smallest fruit.

Cultivar (resistance) ^y	Powdery mildew severity (%) ^z						Yield		
	Upper leaf surface			Lower leaf surface			Total fruit		Marketable
	20-Aug	1-Sep	AUDPC	20-Aug	1-Sep	AUDPC	No./plant	Est. lb/plant	Wt/fruit (lb)
Trophy (PMR).....	1.75	27.63	205.70	3.34	33.96	252.71	3.73 a ^x	14.76 bcde	3.96 f
Apollo (PMR).....	6.51	16.34	159.96	6.21	32.56	257.57	1.73 c	14.80 bcde	8.87 abcd
Magician (PMRR).....	4.34	11.55	111.26	0.88	29.82	226.51	2.48 b	14.61 bcde	5.97 ef
New Racer Plus (PMR)....	5.06	11.48	115.77	1.17	22.65	181.92	2.08 bc	10.98 e	5.28 ef
Magic Lantern (PMR).....	2.17	14.06	113.61	1.55	19.04	147.82	2.08 bc	13.29 cde	6.42 de
Rival (PMR).....	5.48	17.07	157.30	2.18	7.82	96.78	1.83 c	13.35 cde	7.30 cde
Mustang PMR (PMR).....	3.06	10.38	94.03	3.61	21.70	158.02	2.00 bc	20.47 a	10.25 ab
Corvette PMR (PMR).....	7.31	9.41	117.03	4.24	12.71	114.23	2.23 bc	19.64 ab	8.82 abcd
OS 8616 (PMRR).....	3.92	5.23	64.05	2.14	21.50	165.73	2.17 bc	16.32 abcd	7.62 abcde
Gladiator (PMRR).....	1.56	13.40	104.72	0.64	15.66	114.11	1.83 c	13.47 cde	7.32 cde
Challenger PMR (PMR)...	3.90	7.16	77.42	2.54	18.23	135.84	1.89 bc	17.90 abc	9.45 abc
Sorcerer (Susceptible).....	7.97	5.37	93.41	6.14	10.62	117.79	2.21 bc	12.21 de	5.55 ef
Camaro PMR (PMR).....	2.94	8.20	77.99	2.08	9.97	80.62	2.02 bc	21.06 a	10.48 a
<i>P</i> -value (treatment)	0.2533	0.1114	0.2996	0.1736	0.2253	0.2638	<0.0001	<0.0001	<0.0001

^z Exact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1% severity.

^y Cultivars listed based on the sum of AUDPC values for both leaf surfaces. PMR = resistance from one parent and PMRR = resistance genes from both parents.

^x Means followed by the same letter are not statistically different from each other according to Tukey's HSD ($P=0.05$).